NFDRS Indices—Why are they so high? One possible Answer.

Introduction—During the summer of 1999 questions arose in north central Washington about the validity of the calculated NFDRS indices and components. The general scenario at the time was that the calculated large dead fuel moisture values (100 hr TL fuels and the 1000 hr TL fuels) using 1978 fuel models were at or approaching all time lows for the period of the year. NFDRS modeled herbaceous fuel moistures were well into transition and even entered a cured condition in some locations. As a result NFDRS calculated indices and components were also at near record high values. Complicating the concern was that these modeled conditions followed a near record snow pack that stayed in place until early April in most of the area.

During late July several fires were ignited by a series of lightning storms but none posed suppression problems due to the high spread or intensity. A question arose as to why the fires did not respond the way the NFDRS indices indicated they would.

The following observations were made regarding modeled verses observed NFDRS indices and components at the time in an attempt to explain what was happening.

Dead Fuel Moistures—These values appear to have tracked well with the seasonal weather pattern. They were low because there was an extended period without much precipitation between early April until the first week of August. If anything, the modeled 1000 HR moisture values shown in WIMS were only a few points (2-3%) lower than those actually observed in the field. This most likely was because the carryover values used in WIMS at the start of the season were lower than the actual conditions were on the ground in April and early May when the snow melted.

This latter issue is a data quality problem. Even though weather observations may have been entered into WIMS all winter, the precipitation amount and duration were often missing throughout much of the winter because of frozen rain gauges. At the time the NFDRS model did not accommodate snowmelt very well either. As a result the April-July drought period was erroneously extended back in the winter months by the lack of accurate precipitation data being recorded. This resulted in the very low dead fuel moisture values being modeled by NFDRS. Because of subsequent drought like conditions in the spring and early summer, dead fuel moistures progressively got lower.

In many cases the ERC (and BI) values were near all time highs for the date. This is what one would expect with very low, dead fuel moisture values. Again this is most likely due to the unprecedented lack of precipitation since snowmelt <u>but exaggerated by the data problems mentioned above.</u>

As a possible way to avoid this problem in the future, users should monitor the 100 hr and 1000 hr fuel moisture values in the spring after snowmelt. If moisture conditions are significantly different than the WIMS generated or default values, reset the dead fuel moisture carryover values in WIMS to reflect the actual conditions on the ground. This needs to be done early in the season before the time green-up is started to take affect in WIMS.

Live Fuel Moistures—In many instances (those areas with perennial grass type cataloged in their station catalog) the modeled herbaceous and woody fuel moisture values in WIMS appeared to be significantly lower than what was experienced on the ground. The NDVI relative greenness imagery substantiated the field observations in that they show a greener than normal condition over most areas for the period throughout the area.

Looking at the patterns of spring green-up, it appears the model is working correctly considering the weather inputs being used. Again, this process is significantly affected by the lack of moisture during the green-up period. In most cases, the modeled live fuel moistures never exceeded 125% at the peak of green-up, which is about half of that expected in a normal year. This is easily explained by what was happening to the modeled 1000 hour fuel moisture value discussed above. The green-up process is constrained if the 1000 hour fuel moisture values are declining. (Remember the green-up process for herbaceous vegetation is tied to the X-1000 value, which is controlled by the 1000 HR FM. For woody fuel moisture values green-up is tied directly to the 1000 hr fuel moisture.)

What is not being reflected by the model in years like this past, when there was a significant winter snow pack, is the elevated soil moisture levels in the spring that affect the actual growing season well into the summer even though there is no significant additional precipitation. This residual soil moisture extended the true green-up period (or active growing season) well into July at many of the middle and upper elevations. Measured live fuel moisture values were observed to be approaching 200% when the modeled values were in the 80-100% range. These measured values are more consistent with the greenness values being shown on NDVI imagery.

To avoid problems in the future, users should monitor the actual live fuel moisture values in the spring and use them to set the carryover values rather than use the default or WIMS generated values when starting the green-up process.

The above live fuel moisture observations and comments are applicable to those areas where perennial vegetation dominates the herbaceous plant community. The problems and concerns discussed do not appear to be present in the areas dominated by annual plant communities.

Summary—The dead fuel moistures calculated by WIMS appear to be accurate considering the weather parameters that were entered. Live fuel moisture calculations were appropriate also as they are tied to the 1000 hour fuel moisture calculations.

The discrepancy between modeled values and observed conditions is tied to the residual affect the record winter snow pack had on soil moisture and its affect on the actual growing process that is not recognized in the NFDRS model.